FIG. 1
(PRIOR ART)

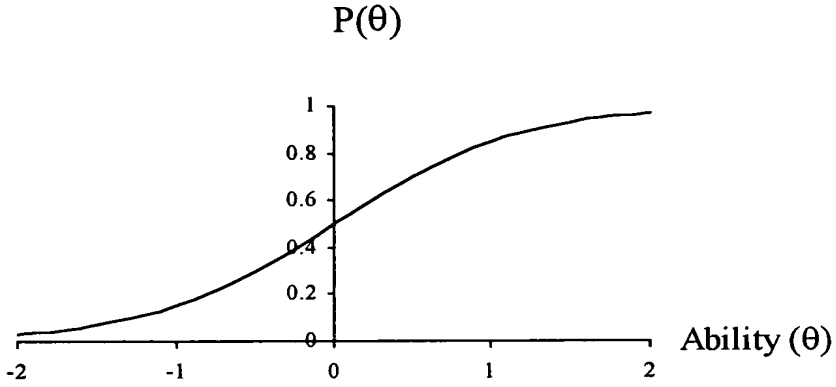

FIG. 2
(PRIOR ART)

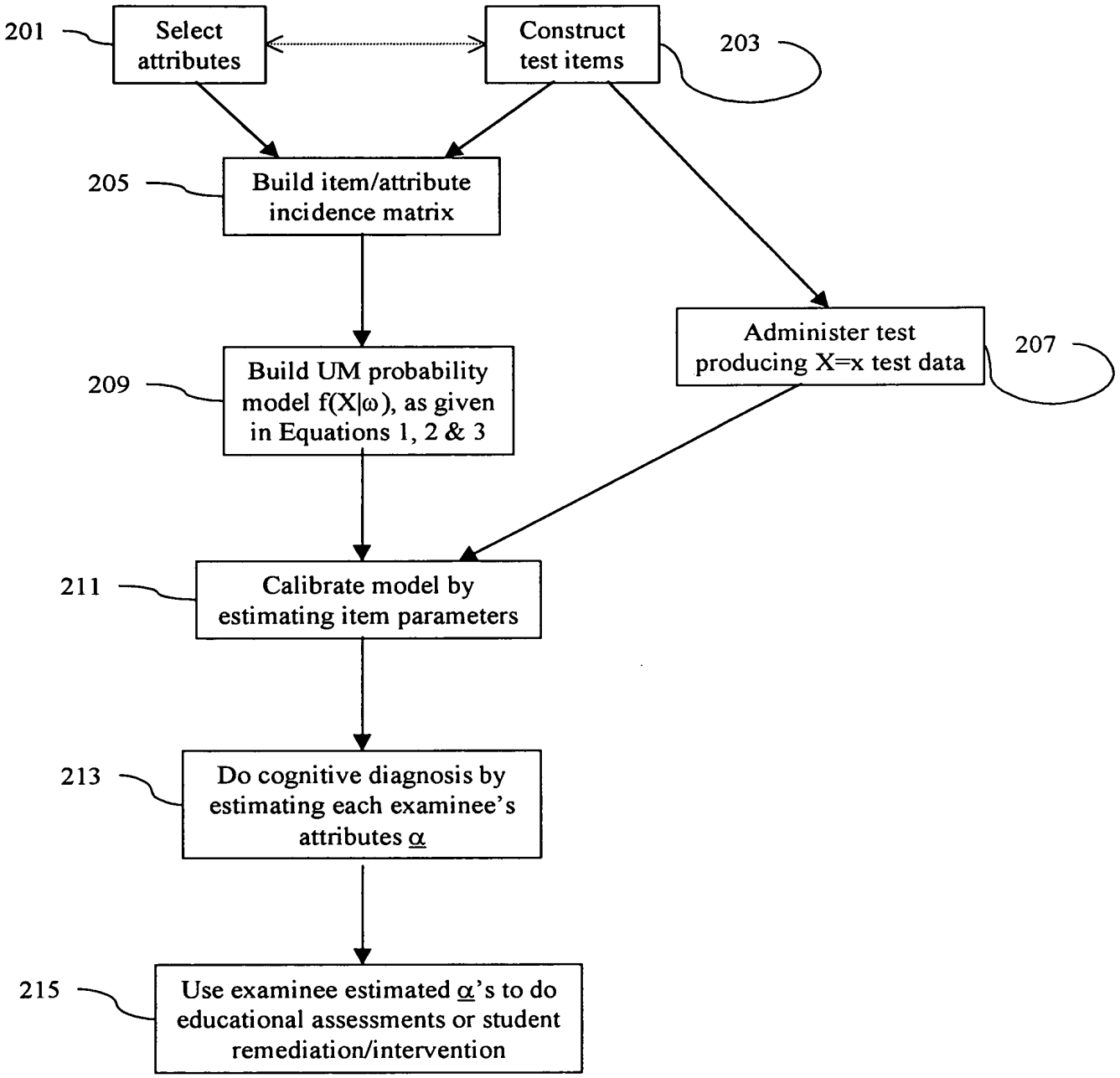

FIG.3
(PRIOR ART)

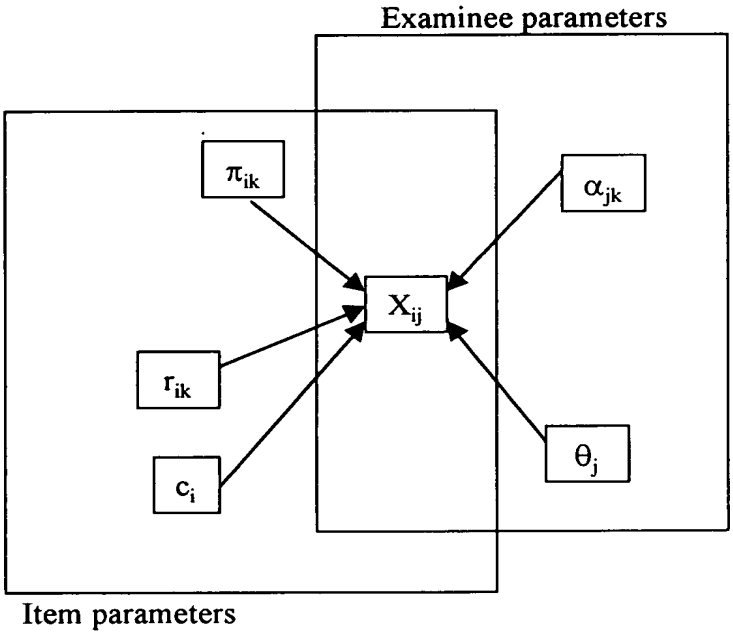

FIG. 4
(PRIOR ART)

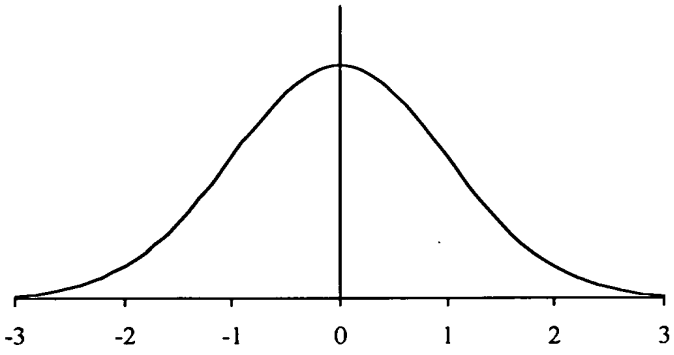

FIG. 5
(PRIOR ART)

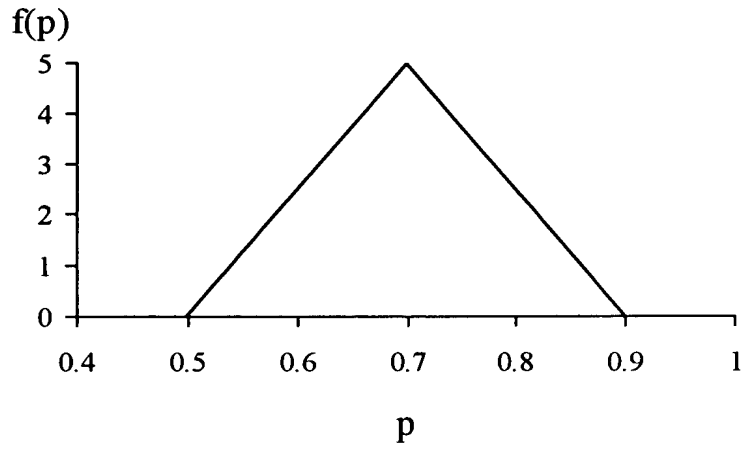

FIG. 6
(PRIOR ART)

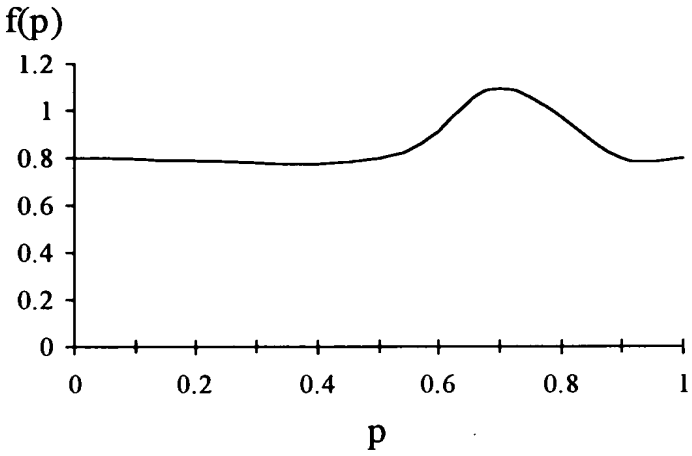

FIG. 7
(PRIOR ART)

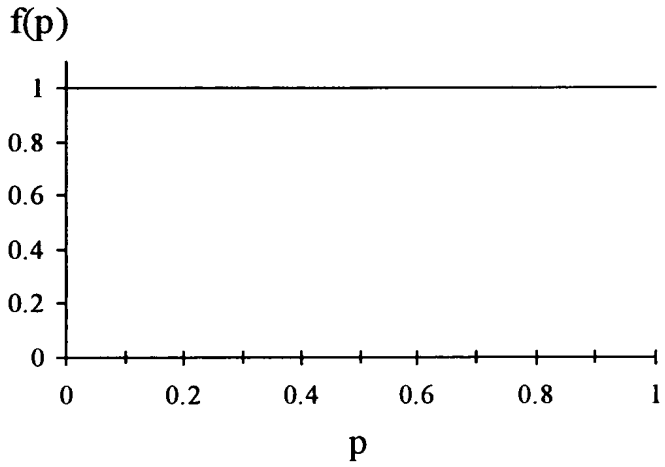

FIG. 8
(PRIOR ART)

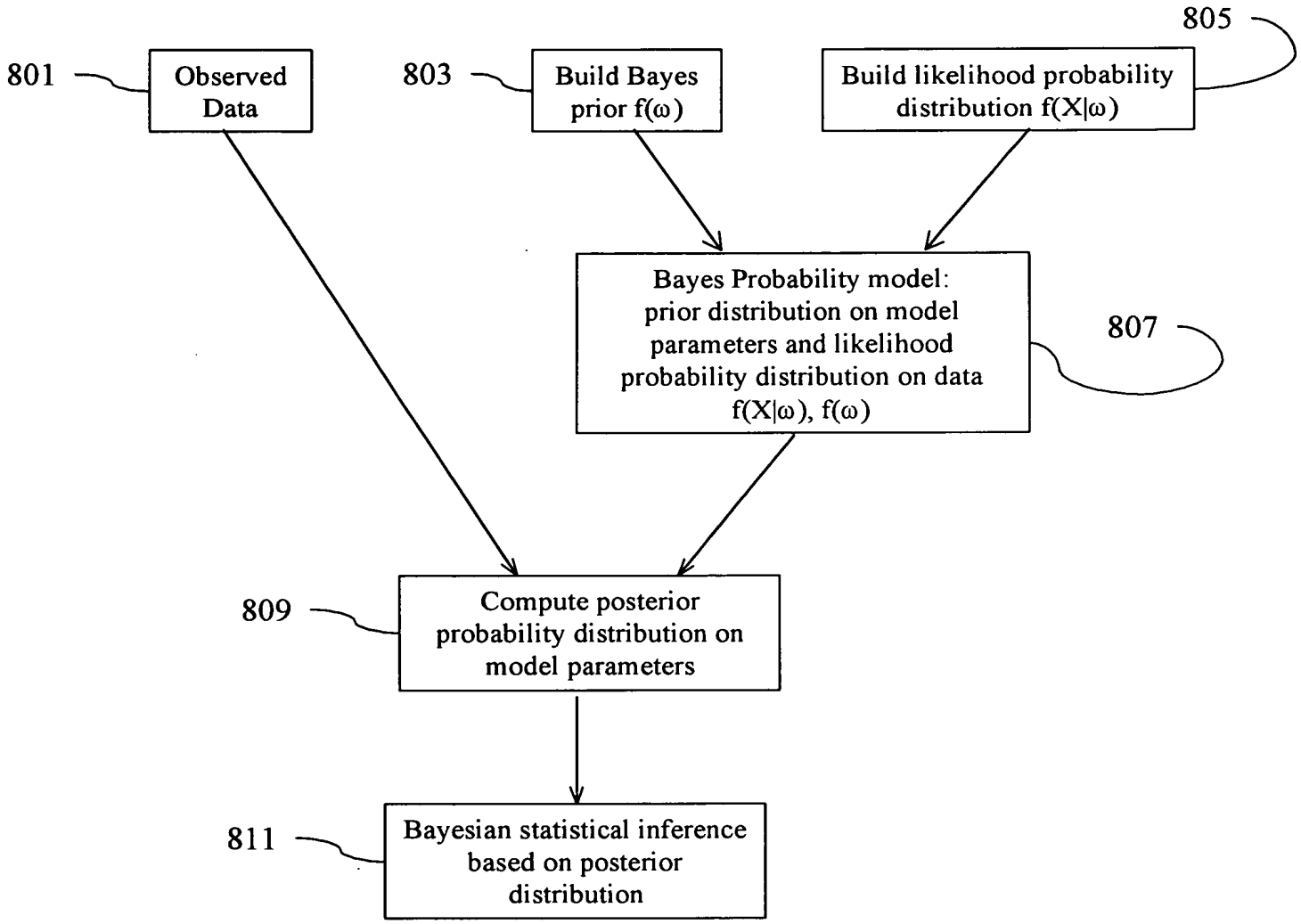

FIG. 9
(PRIOR ART)

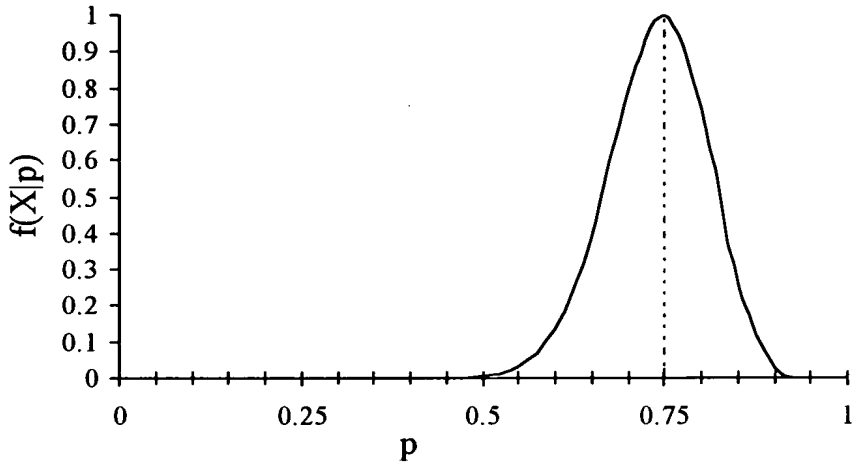

FIG. 10
(PRIOR ART)

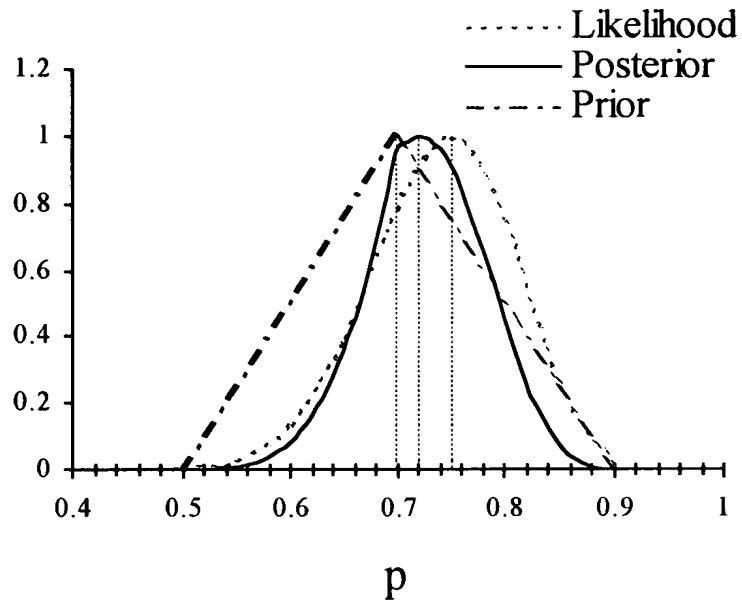

FIG. 11
(PRIOR ART)

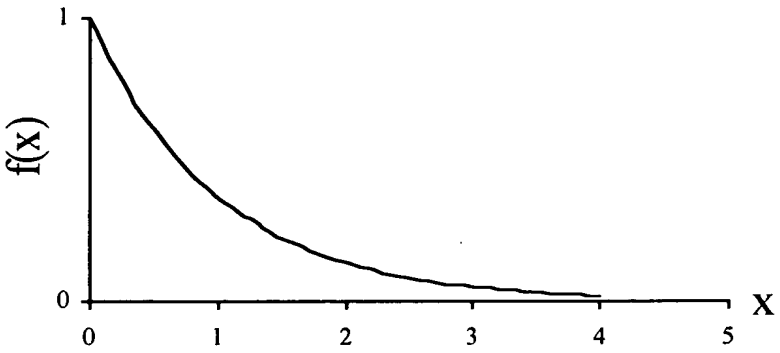

FIG. 12
(PRIOR ART)

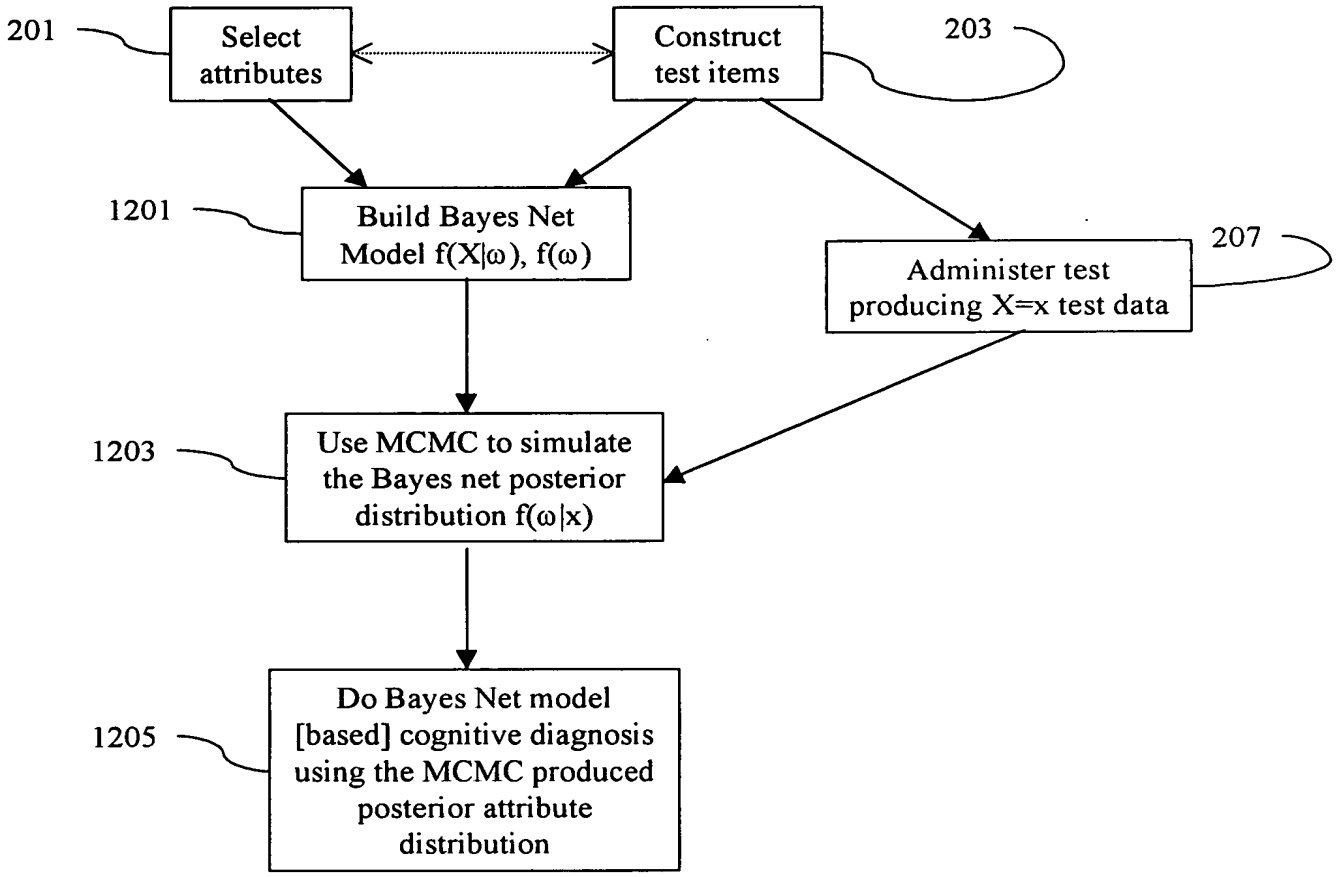

FIG. 13
(PRIOR ART)

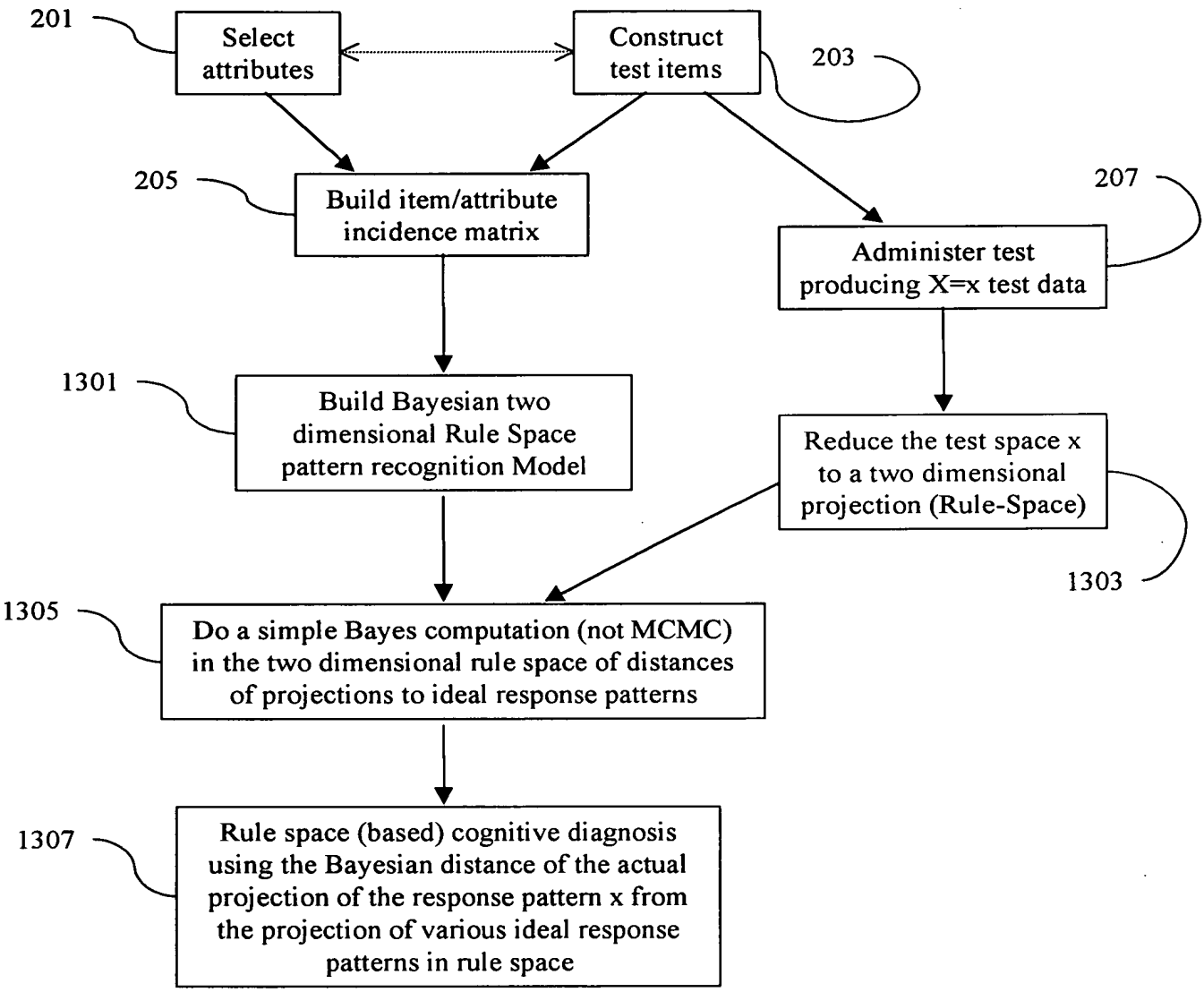

FIG. 14
(PRIOR ART)

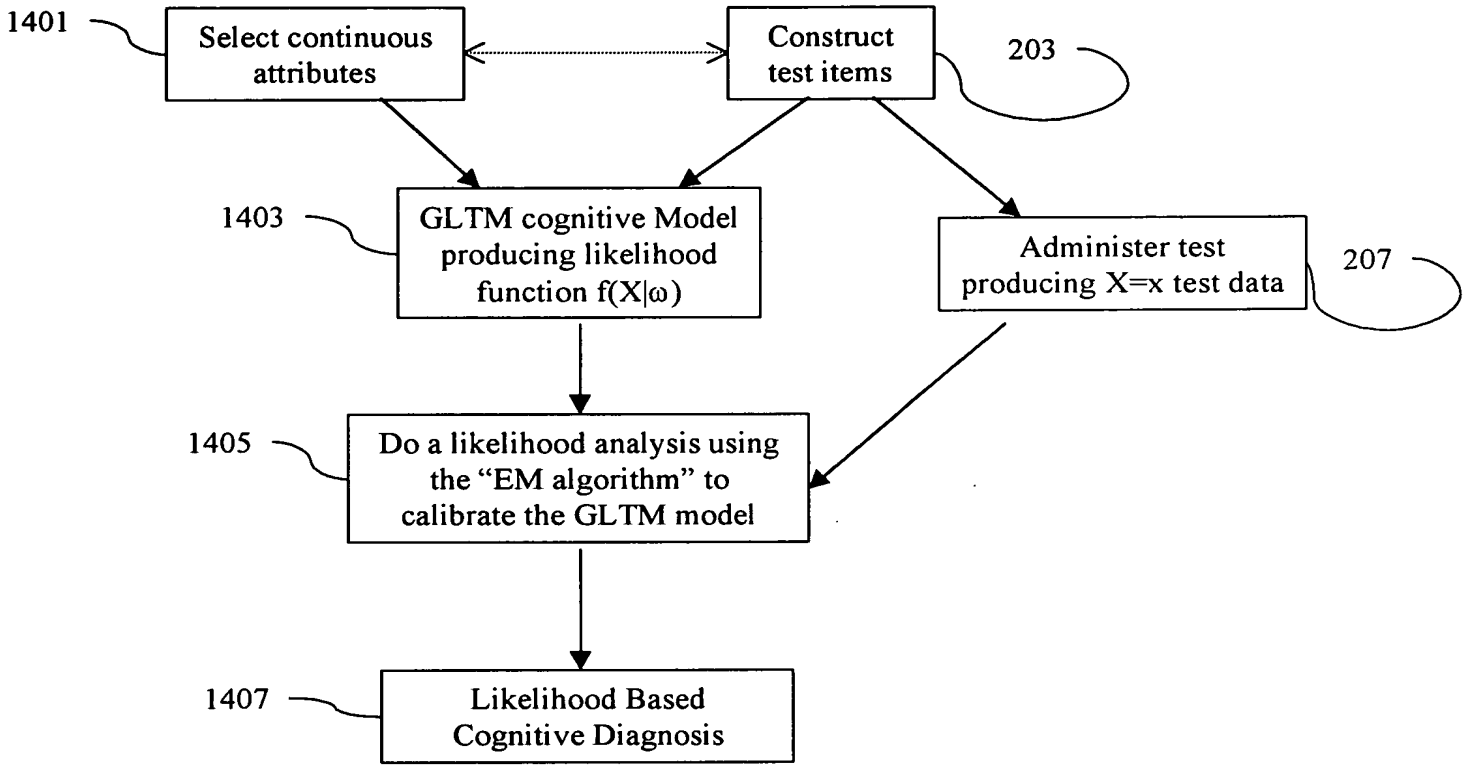

FIG. 15

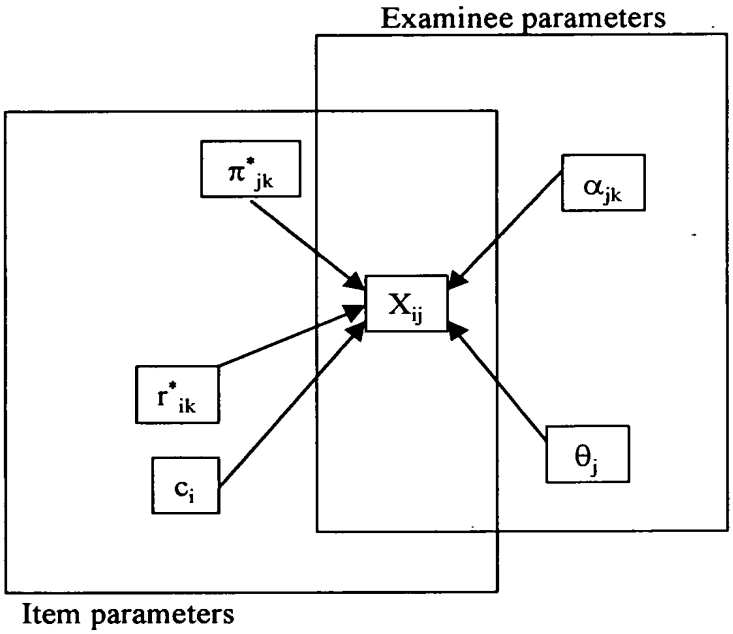
Examinee parameters
π^*_{jk}
α_{jk}
X_{ij}
r^*_{ik}
c_i
θ_j
Item parameters

FIG. 16

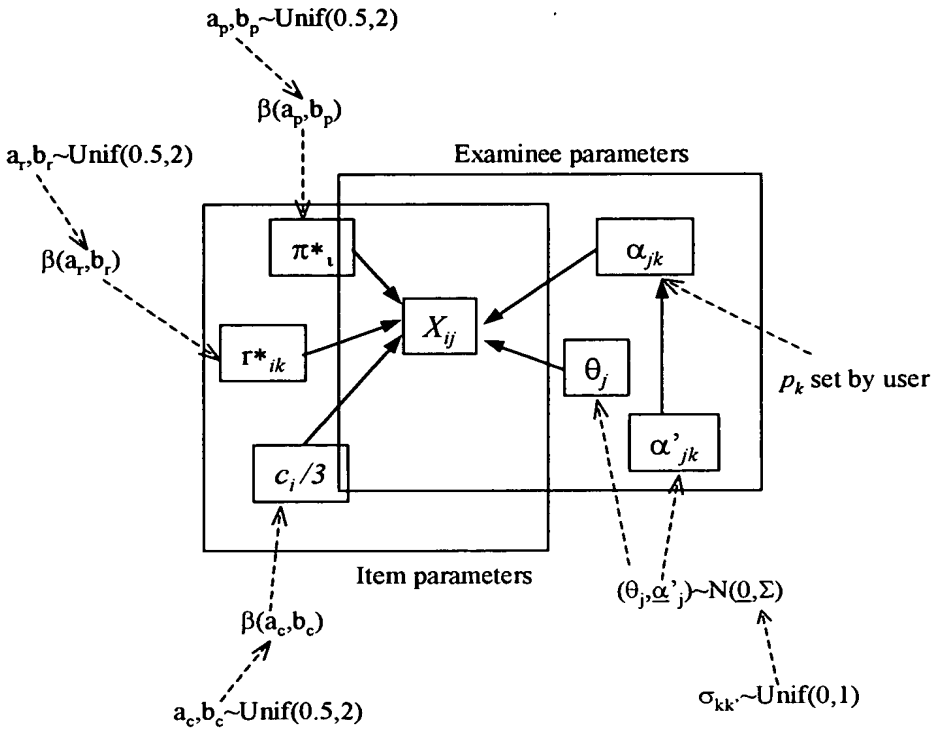
a_p,b_p~Unif(0.5,2)
$\beta(a_p,b_p)$
a_r,b_r~Unif(0.5,2)
Examinee parameters
$\beta(a_r,b_r)$
π^*_i
α_{jk}
r^*_{ik}
X_{ij}
θ_j
p_k set by user
α'_{jk}
$c_i/3$
Item parameters
$(\theta_j,\underline{\alpha}'_j)$~N($\underline{0}$,$\Sigma$)
$\beta(a_c,b_c)$
a_c,b_c~Unif(0.5,2)
$\sigma_{kk'}$~Unif(0,1)

FIG. 17a

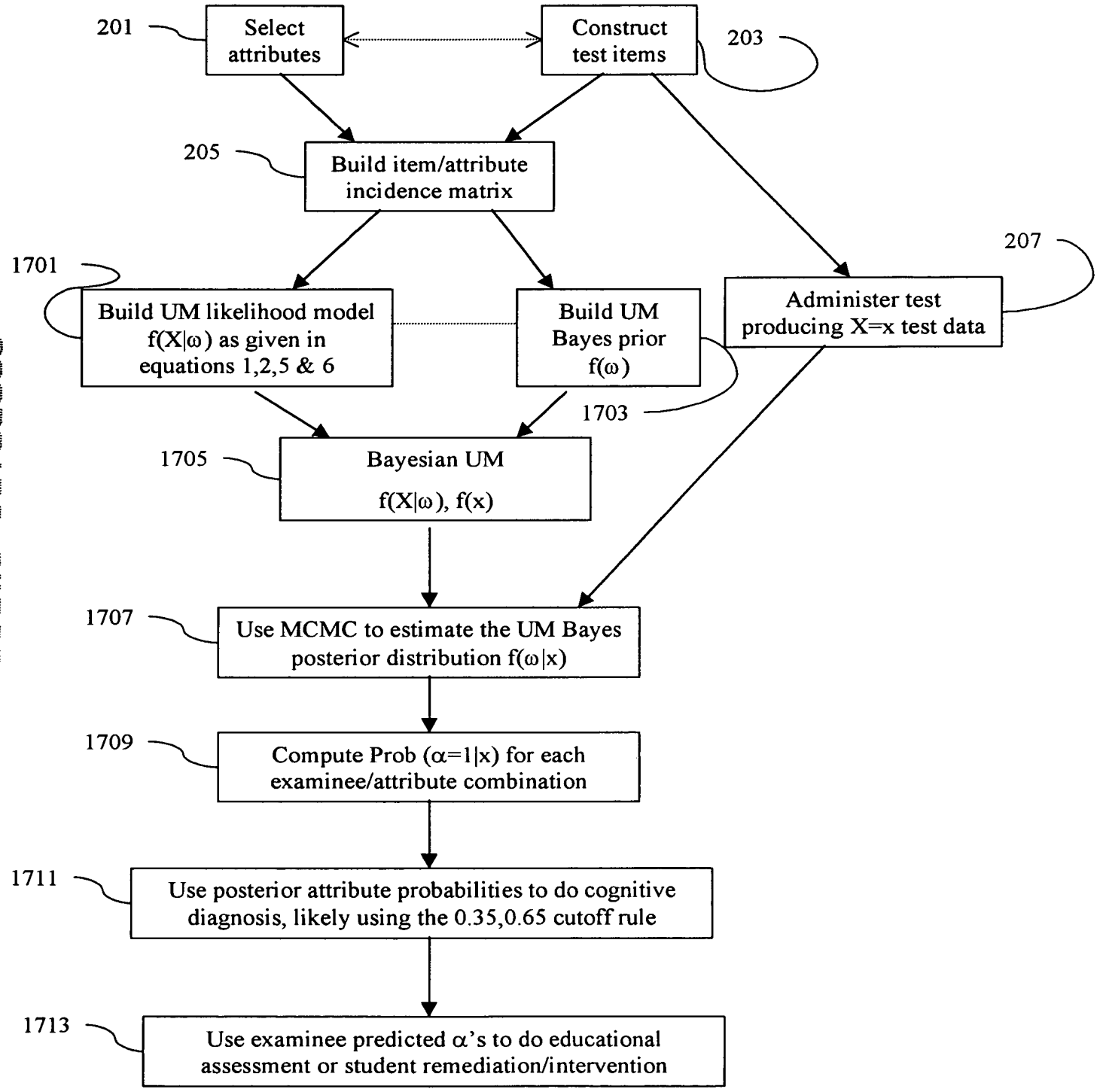
201
Select attributes
Construct test items
203
205
Build item/attribute incidence matrix
1701
207
Build UM likelihood model f(X|ω) as given in equations 1,2,5 & 6
Build UM Bayes prior f(ω)
Administer test producing X=x test data
1703
1705
Bayesian UM
f(X|ω), f(x)
1707
Use MCMC to estimate the UM Bayes posterior distribution f(ω|x)
1709
Compute Prob (α=1|x) for each examinee/attribute combination
1711
Use posterior attribute probabilities to do cognitive diagnosis, likely using the 0.35,0.65 cutoff rule
1713
Use examinee predicted α's to do educational assessment or student remediation/intervention

FIG. 17b

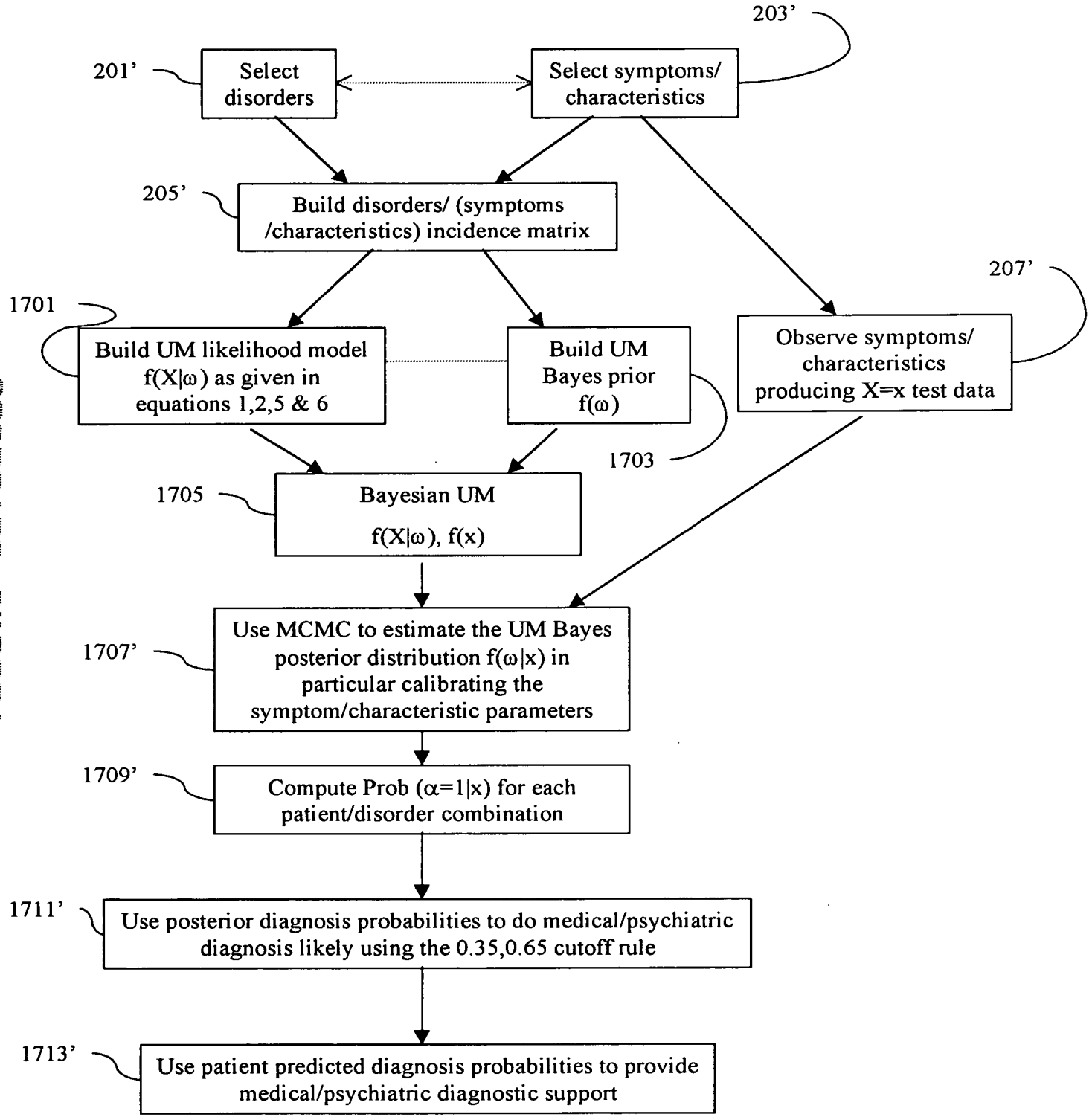
203'
201'
Select disorders
Select symptoms/ characteristics
205'
Build disorders/ (symptoms /characteristics) incidence matrix
207'
1701
Build UM likelihood model f(X|ω) as given in equations 1,2,5 & 6
Build UM Bayes prior f(ω)
Observe symptoms/ characteristics producing X=x test data
1703
1705
Bayesian UM f(X|ω), f(x)
1707'
Use MCMC to estimate the UM Bayes posterior distribution f(ω|x) in particular calibrating the symptom/characteristic parameters
1709'
Compute Prob (α=1|x) for each patient/disorder combination
1711'
Use posterior diagnosis probabilities to do medical/psychiatric diagnosis likely using the 0.35,0.65 cutoff rule
1713'
Use patient predicted diagnosis probabilities to provide medical/psychiatric diagnostic support

FIG. 17c

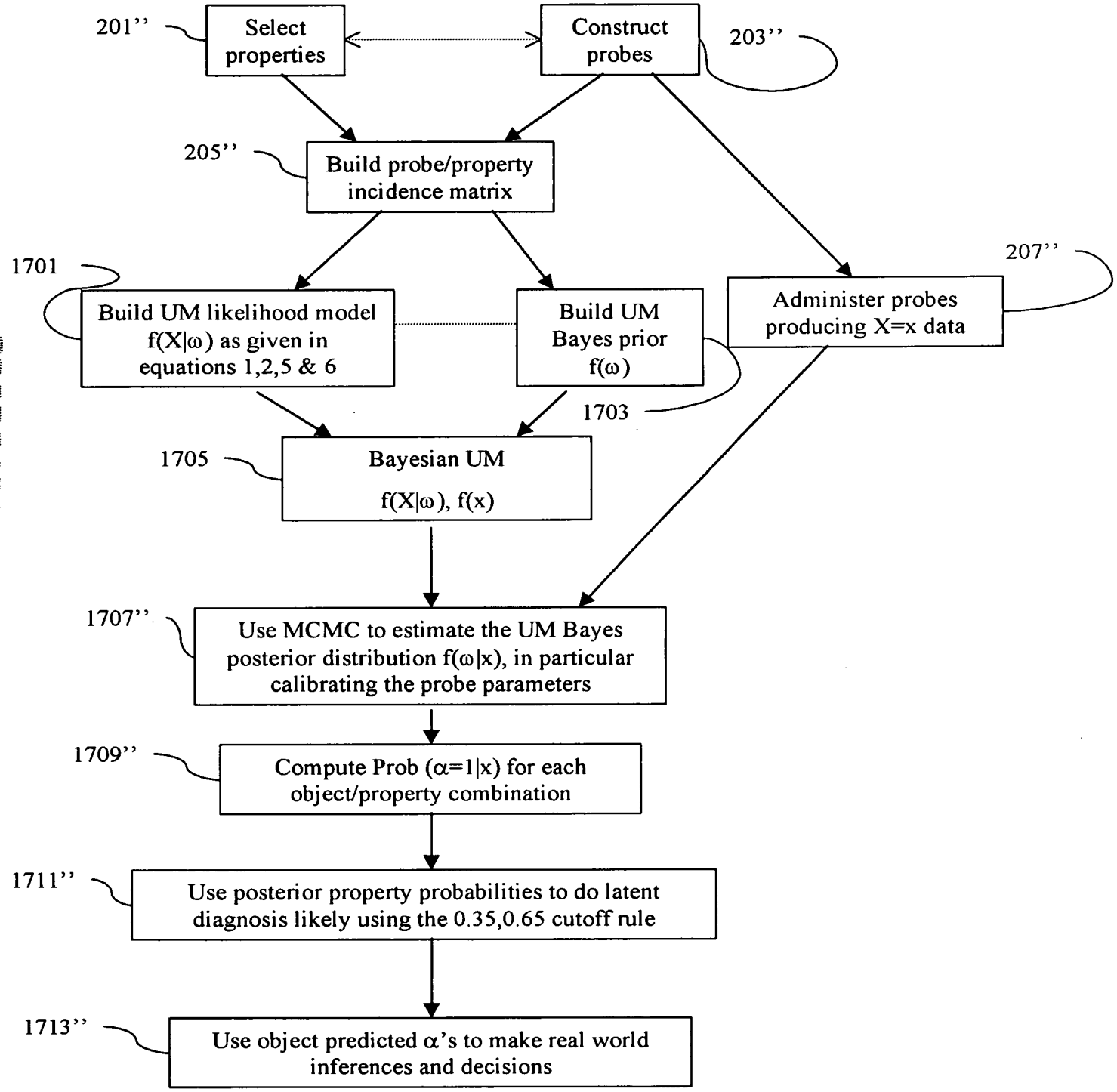
201''
Select properties
Construct probes
203''
205''
Build probe/property incidence matrix
1701
Build UM likelihood model f(X|ω) as given in equations 1,2,5 & 6
Build UM Bayes prior f(ω)
207''
Administer probes producing X=x data
1703
1705
Bayesian UM
f(X|ω), f(x)
1707''
Use MCMC to estimate the UM Bayes posterior distribution f(ω|x), in particular calibrating the probe parameters
1709''
Compute Prob (α=1|x) for each object/property combination
1711''
Use posterior property probabilities to do latent diagnosis likely using the 0.35,0.65 cutoff rule
1713''
Use object predicted α's to make real world inferences and decisions

FIG. 18

[II] Consider the 7 observations: 10, 4, 2, 5, 4, 2, 8.

9. The mean is
(a) 2 (b) 3 (c) 4 (d) 5 (e) 8

10. The standard deviation is
(a) 2 (b) 3 (c) 4 (d) 5 (e) 8

11. The median is
(a) 2 (b) 3 (c) 4 (d) 5 (e) 8

12. The first quartile is
(a) 2 (b) 3 (c) 4 (d) 5 (e) 8

13. The third quartile is
(a) 5 (b) 6.5 (c) 8 (d) 9 (e) 10

[III] The next four questions refer to data sets and their histograms in general.

14. All large data sets have bell-shaped histograms. Is this statement true or false?
(a) True (b) False

15. For large data sets, very close to 50% of the data are smaller than the mean and very close to 50% are greater than the mean.
(a) True for every such large data set
(b) False for some large data sets

16. The median is preferable to the mean as a measure of the center when a data set
(a) is large.
(b) has outliers (unusually large or unusually small values).
(c) is symmetric but is not bell shaped.
(d) has an odd number of points in it.

17. Suppose a large data set has a histogram that is roughly bell-shaped. Suppose that there are no outliers. Then
(a) roughly 68% of the data lies within $\pm s$ of $\bar{x}$.
(b) exactly 68% of the data lies within $\pm s$ of $\bar{x}$.
(c) roughly 95% of the data lies within $\pm 3s$ of $\bar{x}$.
(d) exactly 95% of the data lies within $\pm 3s$ of $\bar{x}$.

18. The median is preferable to the mean as a measure of the center when a data set
(a) is small.
(b) is symmetric but not bell-shaped.
(c) is strongly skewed to the left.
(d) involves biological or financial data.

FIG. 19

	Attributes							
item	1	2	3	4	5	6	7	8
1	1	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0	0
4	1	0	0	0	0	0	0	0
5	1	0	0	0	0	0	0	0
6	1	0	0	0	0	0	0	0
7	1	1	0	0	0	0	0	0
8	1	0	1	0	0	0	0	0
9	0	0	1	0	0	0	0	0
10	0	0	0	1	0	0	0	0
11	0	1	0	0	0	0	0	0
12	0	1	0	0	0	0	0	0
13	0	1	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0
15	0	1	0	0	0	0	0	0
16	0	0	1	0	0	0	0	0
17	1	0	1	1	0	0	0	0
18	0	1	1	0	0	0	0	0
19	0	1	1	0	0	0	0	0
20	1	0	1	0	0	0	0	0
21	1	0	0	1	0	0	0	0
22	1	0	0	1	0	0	0	0
23	0	0	0	0	0	1	0	0
24	0	0	0	0	0	1	0	0
25	0	0	0	0	0	1	0	0
26	0	0	1	0	0	0	0	0
27	0	0	1	0	0	0	0	0
28	0	0	0	1	0	0	0	0
29	0	0	0	1	0	0	0	0
30	0	0	0	0	0	1	0	0
31	0	0	0	0	0	0	1	0
32	0	0	0	0	0	0	1	0
33	0	0	0	0	0	0	1	1
34	0	0	0	0	0	0	1	1
35	0	0	0	0	0	0	1	1
36	0	0	0	0	0	0	1	1
37	0	0	0	0	1	0	0	0
38	0	0	0	0	1	0	0	0
39	0	0	0	0	1	0	0	0
40	0	0	0	0	0	1	0	0
total	13	7	9	6	3	5	6	4